

BLUE WHALE (*Balaenoptera musculus*): Hawaiian Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Blue whales are extremely rare in Hawaii. The only published sighting record is that of Berzin and Rovnin (1966) north of the Hawaiian Islands. Additional evidence that blue whales occur in this area comes from acoustic recordings made off Oahu and Midway Islands (Northrop et al. 1971; Thompson and Friedl 1982; McDonald and Fox 1999). Although the exact positions of the whales producing the sounds could not be determined, at least some of them were within the U.S. Exclusive Economic Zone. The recordings made off Oahu showed bimodal peaks throughout the year, suggesting that the animals were migrating into the area in summer and winter.

The stock structure of blue whales in the North Pacific is uncertain (Mizroch et al. 1984; Reilly and Thayer 1990; Reeves et al. 1998). The International Whaling Commission (IWC) has formally considered only one management stock for blue whales in the North Pacific (Donovan 1991), but now this ocean is thought to include up to five populations (Reeves et al. 1998), with two occurring within the U.S. EEZ. One group of animals feeds in California waters in summer/fall (from June to November) and migrates south to productive areas off Mexico and as far south as the Costa Rica Dome (10° N) in winter/spring (Mate et al. 1999, Stafford et al. 1999). Rice (1974) hypothesized that blue whales from Baja California migrated far offshore to feed in the eastern Aleutians or Gulf of Alaska and returned to feed in California waters; however, he has more recently concluded that the California population is separate from the Gulf of Alaska population (Rice 1992). Length frequency analyses (Gilpatrick et al. 1996) and photo-identification studies (Calambokidis et al. 1995) support separate population status for blue whales feeding off California and those feeding in Alaskan waters. Whaling catch data indicate that whales feeding along the Aleutian Islands are probably part of a central Pacific stock (Reeves et al. 1998), which may migrate to offshore waters north of Hawaii in winter (Berzin and Rovnin 1966). Recently, however, blue whale feeding aggregations have not been found in Alaska despite several surveys (Leatherwood et al. 1982; Stewart et al. 1987; Forney and Brownell 1996). For management in U.S. Pacific waters outside the continental EEZ, the Hawaiian stock includes only those whales within the EEZ of the Hawaiian Islands. One other stock of North Pacific blue whales (off California and Mexico) is recognized in the Marine Mammal Protection Act (MMPA) stock Assessment Reports.

POPULATION SIZE

From ship line-transect surveys, Wade and Gerrodette (1993) estimated 1,400 blue whales for the eastern tropical Pacific. A weighted average estimate of 1,940 blue whales is available for California, Oregon and Washington, based on 1991-96 shipboard line-transect surveys (Barlow 1997) and photographic mark-recapture estimates (Calambokidis and Steiger 1994). No data are available to estimate population size for any other North Pacific blue whale population, including the putative central stock that apparently summered along the Aleutians and wintered north of Hawaii. A summer 1994 shipboard survey within the historical whaling grounds south of the Aleutian Islands yielded no blue whale sightings (Forney and Brownell 1996), nor did a total of twelve aerial surveys conducted in 1993-98 within about 25 nmi of the main Hawaiian Islands as part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study (Mobley et al. 2000).

Minimum Population Estimate

No data are available to provide a minimum population estimate.

Current Population Trend

No data are available on current population trend.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate.

POTENTIAL BIOLOGICAL REMOVAL

No PBR can be calculated for this stock at this time.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

No estimate of annual human-caused mortality and serious injury is available as there are no reports of recent direct or incidental takes of blue whales in Hawaiian waters. However, mortality of other cetacean species has been observed in Hawaiian fisheries, and the gear types used in these fisheries are responsible for marine mammal mortality and serious injury in other fisheries throughout U.S. waters. Gillnets are used in Hawaiian waters and appear to capture marine mammals wherever they are used, and float lines from lobster traps and longlines can be expected to occasionally entangle whales (Perrin et al. 1994). Interactions with dolphins are reported for all pelagic fisheries, and humpback whales have been entangled in longlines off the Hawaiian Islands, but no takes of blue whales have been documented (Nitta and Henderson 1993). None were observed hooked or entangled in the Hawaiian longline fishery between 1994 and 1998, with approximately 4.4% of all effort (measured as the number of hooks fished) observed (Kleiber 1999).

Historical Mortality

At least 9,500 blue whales were taken by commercial whalers throughout the North Pacific between 1910 and 1965 (Ohsumi and Wada 1972). Some proportion of this total may have been from a population or populations that migrate seasonally into the Hawaiian EEZ. The species has been protected in the North Pacific by the IWC since 1966.

STATUS OF STOCK

The status of blue whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. Blue whales are formally listed as "endangered" under the Endangered Species Act (ESA), and consequently the Hawaiian stock is automatically considered as a "depleted" and "strategic" stock under the MMPA. The total fishery mortality and serious injury for blue whales is zero and therefore can be considered to be insignificant and approaching zero mortality and serious injury rate. The increasing levels of anthropogenic noise in the world's oceans has been suggested to be a habitat concern for blue whales (Reeves et al. 1998).

REFERENCES

- Barlow, J. 1997. Preliminary estimates of cetacean abundance off California, Oregon, and Washington based on a 1996 ship survey and comparisons of passing and closing modes. Admin. Rept. LJ-97-11. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA. 25 pp.
- Berzin, A. A. and A. A. Rovnin. 1966. Distribution and migration of whales in the northeastern part of the Pacific Ocean, Bering and Chukchi Seas. Izv. Tikhookean. Nauchno-issled. Inst. Rybn. Khoz. Okeanogr. (TINRO) 58:179-207. {In Russian}. (Translated by U.S. Dep. Inter., Bur. Commer. Fish., Seattle, Washington, 1966, pp. 103-106 In: Panin, K. I. (ed) Soviet Research on marine mammals of the Far East).
- Calambokidis, J., R. Sears, G. H. Steiger, and J. Evenson. 1995. Movement and stock structure of blue whales in the eastern North Pacific. P.19 In: Proceedings of the Eleventh Biennial Conference on the Biology of Marine Mammals, Orlando, FL, 14-18 December 1995 (Abstract). Society for Marine Mammalogy, Lawrence, KS.
- Calambokidis, J., and G. H. Steiger. 1994. Population assessment of humpback and blue whales using photo-identification from 1993 surveys off California. Final Contract Report to Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 31 pp.
- Donovan, G. P. 1991. A review of IWC stock boundaries. Rept. Int. Whal. Commn., Special Issue 13:39-68.
- Forney, K. A. and Brownell, R. L., Jr. 1996. Preliminary report of the 1994 Aleutian Island Marine Mammal Survey. Paper SC/48/O11 presented to the International Whaling Commission, June 1996 (unpublished).
- Gilpatrick, J., W. Perryman, M. Lynn, and M. A. DeAngelis. 1996. Geographic populations of blue whales (*Balaenoptera musculus*) in the North Pacific Ocean investigated from whaling records and aerial photogrammetry. Paper SC/47/NP4 presented to the International Whaling Commission, May 1995 (unpublished).
- Kleiber, P. 1999. Estimates of marine mammal takes in the Hawaiian longline fishery. (Unpublished). Southwest Fisheries Science Center, NMFS, 2570 Dole St, Honolulu, HI, 96822-2396.
- Leatherwood, S., R. R. Reeves, W. F. Perrin, and W. E. Evans. 1982. Whales, dolphins, and porpoises of the eastern North Pacific and adjacent Arctic waters: A guide to their identification. NOAA Technical Rept. NMFS Circular 444. 245 pp.
- Mate, B.R., B.A. Lagerquist, and J. Calambokidis. Movements of North Pacific blue whales during the feeding season

- off southern California and their southern fall migration. *Mar. Mamm. Sci.* 15(4):1246-1257.
- Mizroch, S. A., D. W. Rice, and J. M. Breiwick. 1984. The blue whale, *Balaenoptera musculus*. *Mar. Fish. Rev.* 46(4):15-19.
- Mobley, J. R., Jr, S. S. Spitz, K. A. Forney, R. A. Grotefendt, and P. H. Forestall. 2000. Distribution and abundance of odontocete species in Hawaiian waters: preliminary results of 1993-98 aerial surveys. Admin. Rep. LJ-00-14C. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 26 pp.
- Nitta, E. and J. R. Henderson. 1993. A review of interactions between Hawaii's fisheries and protected species. *Mar. Fish. Rev.* 55(2):83-92.
- Northrop, J., W. C. Cummings, and M. F. Morrison. 1971. Underwater 20-Hz signals recorded near Midway Island. *J. Acoust. Soc. Am.* 49:1909-1910.
- Ohsumi, S. and S. Wada. 1972. Stock assessment of blue whales in the North Pacific. *Int. Whal. Commn. Sci. Comm. Rep.*, 20 pp.
- Perrin, W.F., G.P. Donovan and J. Barlow. 1994. Gillnets and Cetaceans. *Rep. Int. Whal. Commn., Spec. Iss.* 15, 629pp.
- Reeves, R. R., P. J. Clapham, R. L. Brownell, Jr., and G. K. Silber. 1998. Recovery plan for the blue whale (*Balaenoptera musculus*). Office of Protected Resources, NMFS, NOAA, Silver Spring, Maryland. 30 pp.
- Reilly, S. B. and V. G. Thayer. 1990. Blue whale (*Balaenoptera musculus*) distribution in the eastern tropical Pacific. *Mar. Mamm. Sci.* 6:265-277.
- Rice, D. W. 1974. Whales and whale research in the eastern North Pacific. pp.170-195 In: W. E. Schevill (ed.). The Whale Problem: A Status Report. Harvard Press, Cambridge, MA.
- Rice, D. W. 1992. The blue whales of the southeastem North Pacific Ocean. pp. 1-3 In. Alaska Fisheries Science Center, Quart. Rept. Oct.-Dec.
- Stafford, K.M., S.L. Nieukirk, and C.G. Fox. 1999. An acoustic link between blue whales in the eastern tropical Pacific and the northeast Pacific. *Mar. Mamm. Sci.* 15(4):1258-1268.
- Stewart, B. S., S. A. Karl, P. K. Yochem, S. Leatherwood, and J. L. Laake. 1987. Aerial surveys for cetaceans in the former Akutan, Alaska, whaling grounds. *Arctic* 40(1):33-42.
- Thompson, P. O. and W. A. Friedl. 1982. A long term study of low frequency sound from several species of whales off Oahu, Hawaii. *Cetology* 45:1-19.
- Wade, P. R. and T. Gerrodette. 1993. Estimates of cetacean abundance and distribution in the eastern tropical Pacific. *Rep. Int. Whal. Commn.* 43:477-493.